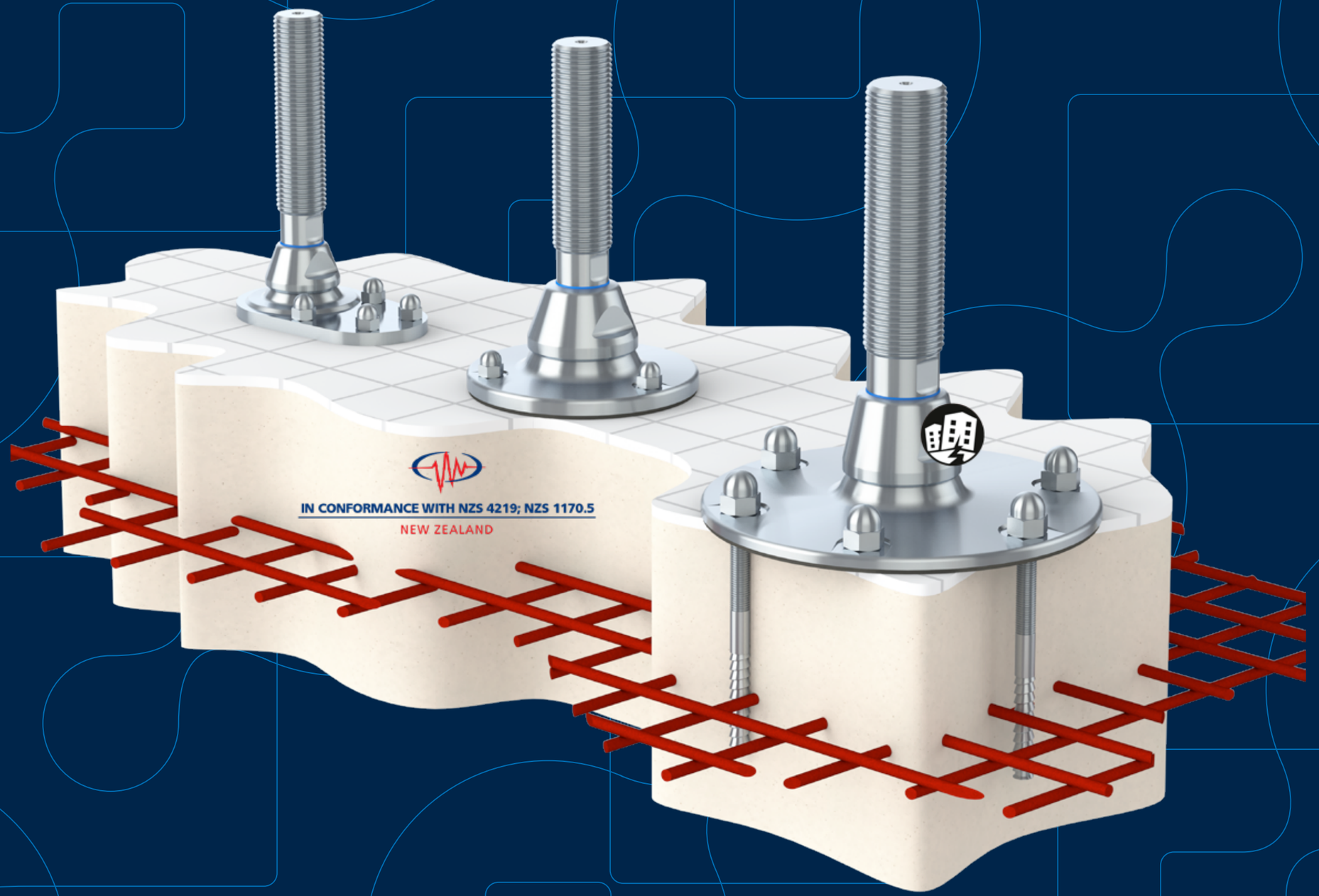
NGI®

The only seismic levelling feet in the world designed and calculated according to the international new zealand seismic standard

The NGI seismic foot is capable of withstanding earthquakes due to its ability to withstand combinations of vertical and horizontal loads



Cleaning & Maintenance

Seismic levelling feet

CLEANING

1. Rinse with water (maximum temperature ~40°C on proteins).
2. Distribute and cover all surfaces with foaming alkaline detergent for minimum 10 minutes. All standard products within the industry can be used. Follow supplier recommendations for temperature (maximum 100°C) and concentration depending on foaming detergent.
3. Rinse with hot water (maximum 100°C) with low-medium pressure (approximately 8-12 bar) until it is visibly clean. Cleaning of the levelling foot including sealings and dome-headed nuts can normally be done with a spraying nozzle pointing in a downwards direction approximately 45°. For heavy duty cleaning a more direct-oriented nozzle can be necessary. Be careful not to damage the sealings if high pressure cleaning is used. Keep nozzle at minimum 200-300 mm distance.
4. Mechanical cleaning may be necessary if the levelling foot is severely soiled. Cleaning must be executed with a soft brush or soft plastic scraper together with a more direct pointing nozzle spray. Steel scraper, steel brush or other sharp metallic tools are strictly prohibited, since the sealings can be severely damaged and the steel surfaces will be scratched.

MAINTENANCE

1. If the sealings on the sleeve are damaged they must be replaced. Always use genuine spare parts from NGI.
2. If the sealing between the foot and the spindle is damaged, replace the whole levelling foot and install a new one. An assembled levelling foot cannot be separated.
3. Load on the levelling foot must be obtained in order for the footplate to be hygienically sealed to the floor.
4. For a levelling foot for floor fixing always make sure that the floor fixing nut or bolt is tightened as specified in the installation manual. Tighten if necessary. If replacement of nuts or washers is always use genuine spare parts from NGI.
5. If any readjustments are necessary the levelling foot and the nearest surroundings must be cleaned carefully to prevent any soil from entering the sleeve.

BEST PRACTICE

- ✓ Position machine to neighboring machine first. Start with the feet closest to neighbor machine. Level with a laser measurement device.
- ✓ Keep machine supports (crane, jack, forklift) near to machine throughout the levelling process for fast response to sudden unexpected events. Ensure that machine never tilts during installation.
- ✓ If using more than 3 levelling feet, make sure that all feet carry weight.
- ✓ Try turning the foot to check if foot is supporting weight.
- ✓ Clean the feet and the floor before feet are lowered to the floor.

DO NOT

- × Do not fasten the levelling feet to the floor until it is fully levelled.
- × Do not lift the machine after it is fastened to the floor.

The design and patent protected NGI Seismic levelling feet is the only hygienic seismic levelling feet in the world designed and calculated according to the international New Zealand seismic standard. The feet have self-draining surfaces, sealed movable parts and no exposed thread which secures absolute minimum cleaning and maximum product safety. Read for example one of our reference cases at our website, where GIG KARASEK has used NGI seismic levelling feet for one of their production sites.

Installation
Seismic levelling feet

It is important to follow these instructions in order to ensure the certified hygienic design and functionality. This documentation is enclosed with the levelling feet and should always be handed over to the end-user.

Preparations prior to installation

A. Prior to installation of the seismic levelling foot ensure that the foot does not exceed the slope of the floor.

B. When installing, make sure that the footplate does not span over cracks, grout lines or other floor imperfections. If unavoidable, seal the cavity with bonding material under and around the edge of the footplate. Remove any dirt or grease from under the footplate.

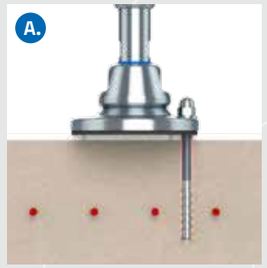
C. Lift the machine with adequate machinery (e.g. jack, forklift, crane) so that seismic levelling feet can be screwed into its intended position on machine.
Screw the thread into the machine until the levelling foot is in its estimated position or in the middle of the adjustment range, lower the machine down and check whether it is levelled.

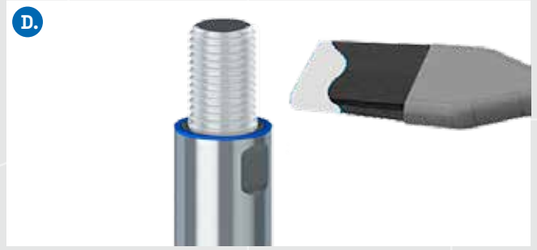
Level the machine by lifting the leg with a jack and adjust the foot to the new position. The turning of the thread is not meant to lift the machine, but only to fine-tune the height. When the machine is levelled and its location is correct, check mark feet location on the floor. See next page how to mark and drill holes.

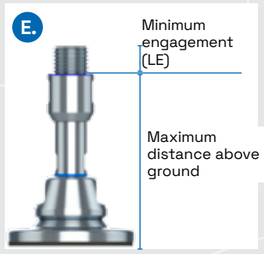
D. Make sure that the sealing is correctly fixed on top of the sleeve. Grease the exposed thread with FoodLube Universal Grease and make sure to remove any excess grease after installation.

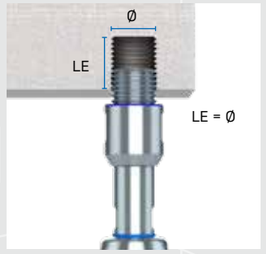
E. Ensure minimum engagement within the machine frame. The minimum engagement (LE) must not be smaller than the spindle diameter. Use a wrench to adjust the vertical position and make sure that the engagement is no less than the diameter of the thread.

During mounting, support weight of seismic levelling foot with suitable tools (e g jack), if needed. Larger sizes of seismic levelling feet can weigh up to 40 kg.









Installation
Seismic levelling feet

It is important to follow these instructions in order to ensure the certified hygienic design and functionality.
This documentation is enclosed with the levelling feet and should always be handed over to the end-user.

Marking of position

1. **MARK HOLES OF FOOTPLATE** with dimensions outlined in footplate dimensions. Use this method with caution, as tolerances in machines might add up and assumed position of holes might not fit afterwards. Alternatively, you can mark the holes through the footplate. When the machine is positioned at its final installation location, mark all holes through the footplates of all seismic levelling feet. Ensure that holes are visibly marked on the floor.

Drilling holes with a drill template can be risky when several seismic feet are used. Tolerances in the machine might add up so that drilled holes might not suit anymore. It is recommended to use the machine as a template for marking holes.

2. **REMOVE THE MACHINE** from the installation location so that all marked drilling spots are visible and easily accessible. Use appropriate machine to lift machine.

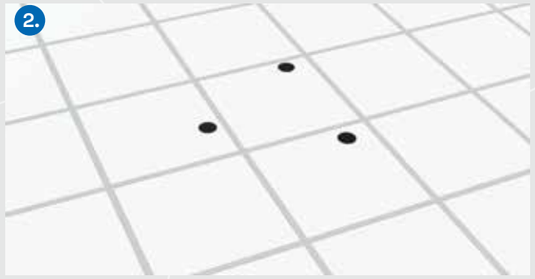
Drilling

3. **DRILL & CLEAN HOLES:**
Through-setting: Drill hole through the clearance holes in the footplate to the required drilling depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.
Through-setting is only allowed for HIT-Z-R anchors. HIT-Z-R anchors do not require cleaning to perform according to seismic standards.

Pre-setting: Drill holes at the marked spots to the required drilling depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit. For dust free drilling use the SAFEset™ drill bit by Hilti. Clean holes from any noticeable dust.

4. **CHECK SETTING DEPTH:** Mark the anchor for the required drilling depth. Compress the drilling dust as the anchor is fit into the hole until the marked depth. If it is not possible to compress the dust, remove the dust in the drill hole or drill deeper. Using Hilti equipment: When drilling with non-cleaning drill sets, the required drilling depths can vary due to accumulation of dust in the hole.

The helixed part of HIT Z R anchors must always be fully inserted into the ground Generally, ensure that sufficient length of thread B+f see FOOTPLATE DIMENSIONS) is above ground and insert remaining length of anchor into the ground. Drilling depths are different for cleaned holes and uncleaned holes. Check for correct drilling depths under FOOTPLATE DIMENSIONS.



Installation
Seismic levelling feet

It is important to follow these instructions in order to ensure the certified hygienic design and functionality.

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Levelling & fastening

5. **PLACE THE MACHINE:** Move the machine back to the final installation location so that holes on the floor match with holes in the footplate.

6. **FIXATE THE MACHINE:** Fixate the position of the machine by putting two anchors through the footplates and into the holes of all seismic levelling feet.

Do not use mortar at this point!

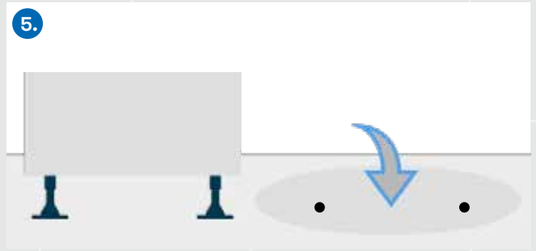
7. **LEVEL & LOCK:** The levelling process can be divided into two steps:
a) Height adjustment and
b) Fine adjustment / levelling of weight.

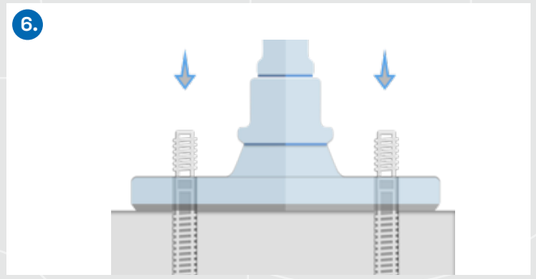
   Whereas step a) refers to the rough adjustment of height with levelling ranges of >2mm, step b) deals with the fine adjustment of a few millimeters.

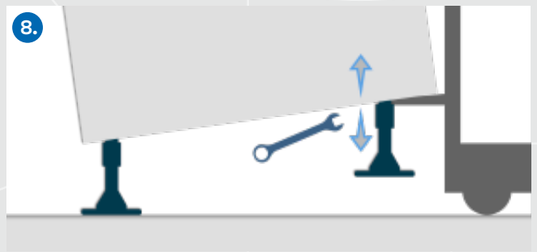
8. **ROUGH HEIGHT ADJUSTMENT >2MM:** Adjust and level machine by turning the spindle clockwise or anticlockwise. Ensure that machine is fully levelled in height and angle before any mortar is used.
   1. Ensure that all footplates rest on floor and carry weight (see description above).
   2. Check levelling of machine with suitable device (e.g. laser measuring device, spirit level).
   3. Fine tune the height of the machine by turning the spindle clockwise for lowering or anti-clockwise for elevating.
   4. Repeat steps 1 to 3 until fully levelled.

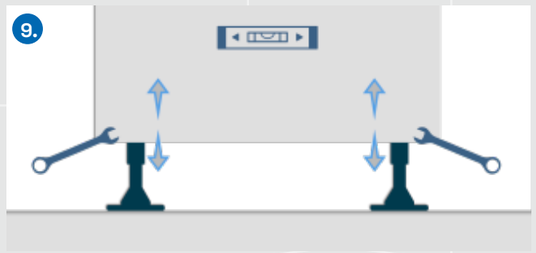
Always lift machine to undertake rough height adjustment of spindles. Generally, this applies to adjustments of more than 2mm in height.

9. **FINE ADJUSTMENT / LEVELLING OF WEIGHT:** Ensure that the weight of machine is equally distributed on all levelling feet. This can be done by attempting to lift the machine by turning the spindle minimally. All feet should require the same torque to do this. This step requires to “feel” the required torque to lift the machine by turning the spindle.
   1. Ensure that all footplates rest on floor and carry weight (see description above).
   2. Check levelling of machine with suitable device (e.g. laser measuring device, spirit level).
   3. Fine tune the height of the machine by turning the spindle clockwise for lowering or anti-clockwise for elevating.
   4. Repeat steps 1 to 3 until fully levelled









The turning of the thread now is not meant to lift the machine, but only to fine-tune the height. Do not level machine under full weight. Lower machine by clockwise turning, elevate machine by anticlockwise turning.

Installation
Seismic levelling feet

It is important to follow these instructions in order to ensure the certified hygienic design and functionality.

This documentation is enclosed with the levelling feet and should always be handed over to the end-user.

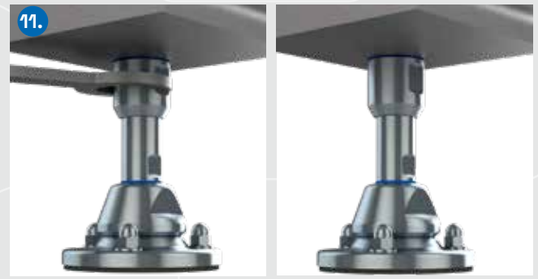
Locking of spindle to the footplate and machine

10. **LOCK THE SPINDLE TO THE FOOTPLATE**: Lock the spindle to the footplate by turning the top nut clockwise with required torque.

Locking the top nut increases the strength of the seismic levelling foot to obtain highest possible safety against bending. As it is not possible to guarantee a complete locking of spindle to footplate and thus, movement during earthquakes, a freely moving joint is assumed Any locking of the top nut therefore increases the strength of the seismic levelling foot

11. **LOCK SLEEVE OR COUNTER NUT TO MACHINE**: Turn the sleeve anti-clockwise up to its highest position to cover the thread in between machine and sleeve. The sleeve is not designed to carry any weight. It is used to fulfill hygienic requirements and to act as a counter nut to the machine.

Always ensure that the sleeve can cover the whole length of the thread. If not, the minimum level of engagement is not met and the strength of the levelling foot is not guaranteed.



Installation
Seismic levelling feet

It is important to follow these instructions in order to ensure the certified hygienic design and functionality.

This documentation is enclosed with the levelling feet and should always be handed over to the end-user.

Fasten the foot to the floor

12. **REMOVE FIXATING ANCHORS:** Remove any lose anchors that were put into place during step 11.

13. **INJECT MORTAR:** Inject adhesive from the ground of the borehole without forming air voids, starting at the bottom of the hole, slowly withdrawing the mixer with each trigger pull.

    As a rule of thumb, fill holes 50% with mortar for through setting, or as required to ensure that the annular gap between the anchor and the concrete is completely filled with adhesive along the embedment length. Fill up the holes of the footplate with mortar to add additional stability.

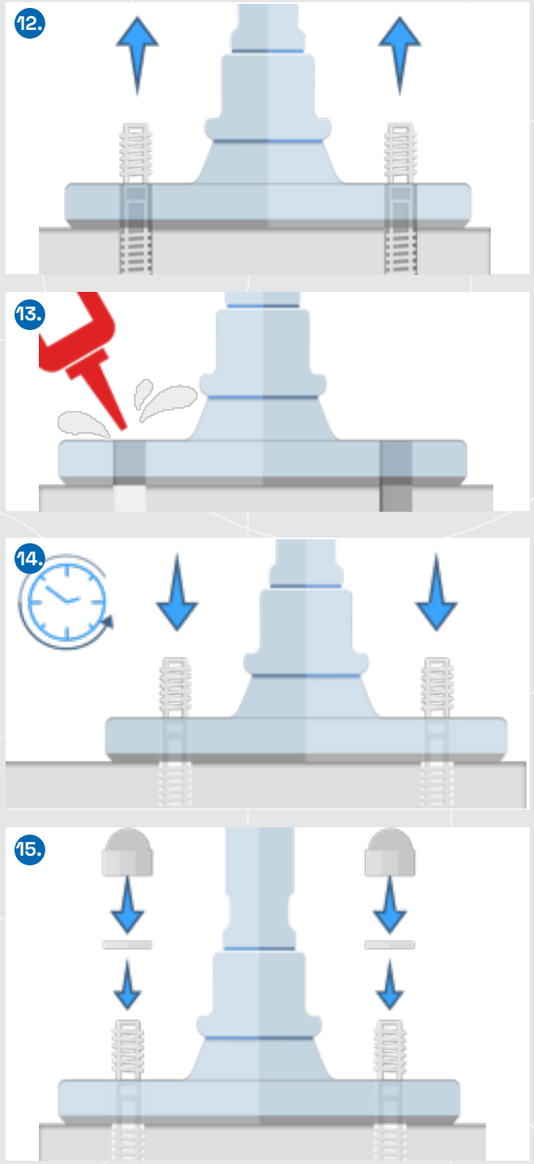
    Find the required amount of mortar in the footplate datasheet or in table 3.

14. **INSTALL ANCHOR:** Install anchor through positioned footplate. Remove any excess mortar on the top side of the footplate. Ensure that anchors are installed before mortar's working time t,work has elapsed, see table 1. It is recommended to install all anchors of one footplate before moving on to other levelling feet to avoid hardening of mortar before all anchors are installed. If anchors are too long, cut off excessive length with appropriate tooling.

Install anchors only when machine is fully levelled. Once anchors are installed, horizontal adjustment of machine is limited to very small changes. If major height adjustments are needed, lift machine with caution to not damage the already dried up mortar. Then, repeat procedure outlined in step 3a and 3b.

Damage to dried mortar can result in complete loss of seismic strength of the anchors.

15. **FASTEN FOOT:** After curing time t,cure has elapsed, see table 1, use the washer and dome-headed nut to fasten the seismic levelling foot to the floor. Set washers (DIN 125A) and dome headed nuts (DIN 1587) at the anchor rod and tighten them with the maximum tightening torque according to table 3.



Installation steps
Seismic levelling feet

The installation of the seismic levelling foot can be done through either one of the following three methods. Detailed descriptions of the steps can be found in the installation manual at the previous pages.

METHOD	TASK	STEP	THROUGH FIXING	DRILLING WITH TEMPLATE	USE MACHINE AS TEMPLATE
			When all sides of the seismic levelling foot can be reached with a drilling machine, while feet are installed on machine.	When the exact position of the feet is known and holes can be drilled prior to machine installation.	Levelling foot are not reachable with a drilling machine when feet are installed on machine or final position of machine needs to be determined during installation.
MARK	Mark holes	1.	✗	✓	✓
	Remove the machine	2.	✗	✗	✓
DRILLLING AND LEVELLING	Drill & clean holes	3.	✓	✓	✓
	Check setting depth	4.	✓	✓	✓
	Place the machine	5.	✗	✓	✓
	Fixate the machine	6.	✓	✓	✓
LOCKING OF SPINDLE	Rough height adjustment	8.	✓	✓	✓
	Fine adjustment / levelling of weight	9.	✓	✓	✓
	Lock spindle to the footplate	10.	✓	✓	✓
	Lock sleeve or counter nut to machine	11.	✓	✓	✓
FASTEN THE FOOT TO F THE LOOR	Remove the fixating anchors	12.	✓	✓	✓
	Inject the motar	13.	✓	✓	✓
	Install the anchor	14.	✓	✓	✓
	Fasten the foot	15.	✓	✓	✓

Tables

Seismic levelling feet

MORTAR — Table 1

TEMPERATURE OF BASE MATERIAL [°C]	TEMPERATURE OF BASE MATERIAL [° F]	INSTALLATION TIMES HIT-V ANCHORS t,work	INSTALLATION TIMES HIT-V ANCHORS t,cure	INSTALLATION TIMES HIT-Z ANCHORS t,work	INSTALLATION TIMES HIT-Z ANCHORS t,cure
-10...-5	14...23	1.5 h	7 h	-	-
> -5...0	> 23...32	50 min	4 h	-	-
> 0...5	> 32...41	25 min	2 h	-	-
> 5...10	> 41...50	15 min	75 min	15 min	75 min
> 10...20	> 50...68	7 min	45 min	7 min	45 min
> 20...30	> 68...86	4 min	30 min	4 min	30 min
> 30...40	> 86...104	3 min	30 min	3 min	30 min

SPINDLE — Table 2

SPINDLE SIZE	MINIMUM RECOMMENDED LENGTH OF ENGAGEMENT L,E [mm]	TIGHTENING TORQUE COUNTER NUT [Nm]
M30	30	740
M36	35	1300
M42	40	*
M48	45	*
M56	55	*
M64	65	*
M72	70	*
M80	80	*
M90	90	*

ANCHOR — Table 3

ANCHOR TYPE	TYPE	TIGHTENING TORQUE F [Nm]	REQUIRED MORTAR** PER ANCHOR [ml]
HIT-Z-R	M10x135	25	13
HIT-Z-R	M10x160	25	13
HIT-Z-R	M12x155	40	18
HIT-Z-R	M12x196	40	18
HIT-Z-R	M16x205	80	34
HIT-Z-R	M16x240	80	39
HIT-Z-R	M20x250	150	60
HIT-V-R	M24x330	200	135

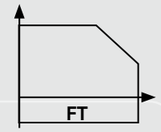
**Includes filling up the annular gap in the footplate for providing additional horizontal stability.
*These values are only valid as guidelines, not exact values due to the geometry of the counter nut.

Exact tightening values cannot be determined, therefore calculation of the seismic foot assume the worst case that the counter nut is loose during an earthquake.

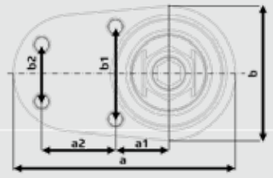
Footplate dimensions

Seismic levelling feet - small

All dimensions for standard footplate sizes for SMALL footplates.

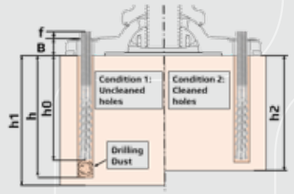


HXJCFE FOOTPLATE



XHJSE FOOTPLATE

INSTALLATION DIMENSIONS



1) GENERAL (all footplates)

1.1 Mortar	HIT-HY 200
1.2 Proof of calculation	Design method ACI 318-08 / Chem
1.3 Installation method	Hammer drilled hole, Installation condition: Dry
1.4 Base material (Concrete quality)	Cracked concrete, C20/25, fc' = 2901 psi; Temp. short/long: 40/24 °C
	An improved concrete quality can greatly improve the performance of the used anchors.

2) DIMENSIONS [mm]

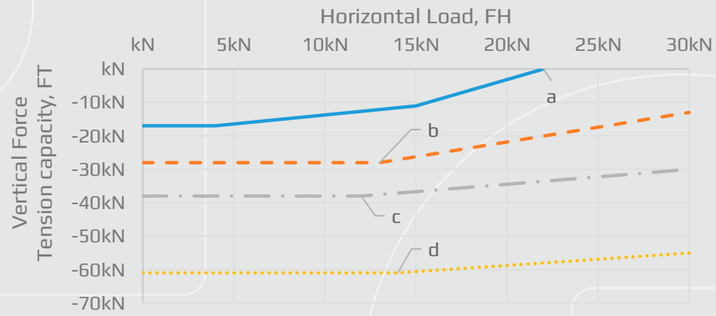
		HXJCFE150(S) a	XHJE150(S) b	XHJE200(S) c	XHJE250(S) d
2.1 Dimensions	bxa or Ø	150x250	150	200	250
2.2 Position	a1xb1; a2xb2 or E	60x104; 143x64	60	80	101
2.3 Thickness footplate	B	15	20	20	20
2.4 Height nut & washer	f	12.5	10	12.5	16
2.5 Setting depth	h	125	120	120	170
2.6 Concrete depth 1	h1	185	180	180	270
2.7 Concrete depth 2	h2	155	150	150	200

3) ANCHORS

3.1 Amount	-	4	3	4	4
3.2 Type	-	HIT-Z-R	HIT-Z-R	HIT-Z-R	HIT-Z-R
3.3 Thread size x Length	[mm]	M12x155	M10x160	M12x155	M16x205
3.4 Drill diameter	[mm]	14	12	14	18
3.5 Tightening torque	[Nm]	40	25	40	80
3.6 Mortar per footplate	[ml]	68	42	68	128

4) TENSION CAPACITY FT

4.1 Max Tension (FH1|FT1)	[kN]	4 | -17	13 | -28	12 | -38	14 | -61
4.2 Reduced Tension (FH2|FT2)	[kN]	15 | -11	30 | -13	30 | -30	30 | -55
4.3 No Tension (FH3|FT3)	[kN]	22 | 0	-	-	-

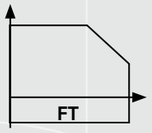


Note: Tension capacity only shown up to FH=30kN, as largest possible spindle to combine with is limited to 30kN.

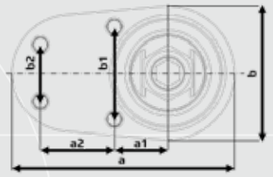
Footplate dimensions

Seismic levelling feet - large

All dimensions for standard footplate sizes for LARGE footplates.

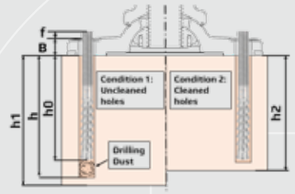


HXJCFE FOOTPLATE



XHJSE FOOTPLATE

INSTALLATION DIMENSIONS



1) GENERAL (all footplates)

1.1 Mortar	HIT-HY 200
1.2 Proof of calculation	Design method ACI 318-08 / Chem
1.3 Installation method	Hammer drilled hole, Installation condition: Dry
1.4 Base material (Concrete quality)	Cracked concrete, C20/25, fc' = 2901 psi; Temp. short/long: 40/24 °C An improved concrete quality can greatly improve the performance of the used anchors.

2) DIMENSIONS [mm]

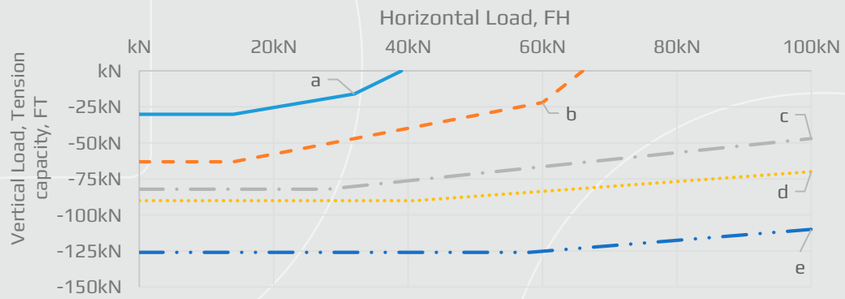
		HXJCFE300(L) a	XHJE250(L) b	XHJE300(L) c	XHJE350(L) d	XHJE400(L) e
2.1 Dimension	bxa or Ø	300x400	250	300	350	400
2.2 Position	a1xb1; a2xb2 or E	86x216; 200x120	101	121	142	166
2.3 Thickness footplate	B	15	20	20	20	20
2.4 Height nut & washer	f	19	16	19	19	23
2.5 Setting depth	h	190	190	210	210	285
2.6 Concrete depth 1	h1	290	290	310	310	385
2.7 Concrete depth 2	h2	250	250	270	270	345

3) ANCHORS

3.1 Amount	-	4	3	4	6	6
3.2 Type	-	HIT-Z-R	HIT-Z-R	HIT-Z-R	HIT-Z-R	HIT-V-R
3.3 Thread size x Length	[mm]	M16x240	M16x240	M20x250	M20x250	M24x330
3.4 Drill diameter	[mm]	18	18	22	22	28
3.5 Tightening torque	[Nm]	80	80	150	150	200
3.6 Mortar per footplate	[ml]	140	105	212	318	738

4) TENSION CAPACITY FT

4.1 Max Tension (FH1|FT1)	[kN]	14 | -39	14 | -63	28 | -82	41 | -90	58 | -126
4.2 Reduced Tension (FH2|FT2)	[kN]	48 | -20	60 | -22	100 | -47	100 | -70	100 | -110
4.3 No Tension (FH3|FT3)	[kN]	58 | 0	66 | 0	-	-	-



Installation

Disclaimer

Where do seismic design values come from?
Seismic design values are gathered from several sources. The United States Geological Survey (USGS) (www.usgs.gov) lists up seismic design values from around the world. Furthermore, national standards such as the NZS 4219 contain country specific seismic design values which are also taken into consideration. Lastly, the United Facility Criteria (UFC) has compiled a list of seismic design values specifically for the USA and other locations around the world.

Why does NGI use NZS 4219 and IBC 2009 instead of national standards?
NGI uses the New Zealand Standard 4219:2006 (NZS) and International Building Code 2009 (IBC) for various reasons: First, NGI has compared several national earthquake standards from around the world and has concluded that resulting forces of these standards largely depend on many assumptions made for the calculation of occurring forces during an earthquake. Although these assumptions are expressed with different words and different levels of detail, they all result in similar forces when similar sounding assumptions are made. The NZS4219 was found to be the most accessible and most comprehensible national code for estimating forces during an earthquake. Second, the IBC is used to extend seismic design values for seismic regions around the world. The IBC calls these values “seismic ground motion values”. Third, NGI’s core expertise lies in the design and engineering of levelling feet. The NZS and IBC are used to recommend suitable levelling feet for seismic areas. Therefore, NGI can give a quantitative estimation of seismic forces to be expected in a given location under certain assumptions. In any case, national standard codes need to be followed for any machinery delivered into seismic areas. NGI’s calculations are to be understood as an estimation of forces which are not legally binding and need always be verified by the customer.

Where can I find the exact values and codes used in the seismic calculation?
The NZS and IBC are both freely available on the internet. NGI uses a simplified version of the formulas used in the NZS that is tailored towards bottom restrained equipment. This is to simplify the selection process of assumptions for the customer. Any values resulting from these assumptions are rounded up to the next reasonable integer and serves as an increased safety factor for seismic calculations.

Is my machine seismic certified when I use NGI seismic levelling feet?
NGI seismic levelling feet are designed to fasten machinery and equipment safely to the ground in case of additionally occurring forces. This can happen during earthquakes, wind loads or any other expected or unexpected horizontal and vertical loads. NGI seismic levelling feet are able to compensate forces up to a given maximum limit, as outlined in the corresponding datasheet and only when installed as described in the installation manual. NGI cannot take responsibility for any other component that is directly or indirectly attached to NGI’s seismic levelling feet. It is the machine builder’s responsibility to ensure that the machine as a whole is seismic certified according to the respective national seismic standard.

Can NGI also calculate forces for machines with complex geometries?
NGI calculates forces according to a static model in which forces can occur either directly at the feet or at the machine’s center of gravity. NGI offers this service for all customers when the machine’s geometry allows a simplification of the model. In cases when the geometry is perceived to be too complex (e.g. the center of gravity is almost above the furthest levelling foot) or not suitable for simplification, NGI reserves the right to ask the customer for a calculation of forces. In any case, calculations undertaken by NGI always need to be verified by the customer and do not replace a detailed seismic calculation or simulation of the machine.

Do I need to use the recommended HILTI anchors?
NGI’s seismic levelling feet are designed to be installed with HIT V or HIT Z anchors by HILTI as outlined in the respective datasheet. The recommended anchors guarantee that NGI’s seismic levelling feet can sustain the combination of vertical pull forces and horizontal shear forces. If seismic levelling feet are used in combination with any other anchors than the recommended ones, the strength of the seismic feet cannot be guaranteed and must be calculated by the customer.

Height adjustments

Seismic levelling feet

Visit our channel at Vimeo and see a short video showing how to height adjust our seismic levelling feet. Also find a quick guide below.

See video here

QUICK GUIDE OF HOW TO ADJUST SEISMIC FEET:

1. **First make sure that the spindle is not locked to the foot by turning the topnut counterclockwise***
2. **Adjust height as shown by turning <u>both</u> spindle and topnot clockwise with a wrench**
3. **Once the machine has been levelled lock the topnut by turning it clockwise.**

* The spindle should not turn when unlocking. It is only when adjusting the height the topnot and spindle must turn. Maximum three full turns per foot at one time.

NGI

Seismic Configurator online

Make sure you choose the right seismic levelling foot

We highly recommend that you contact our specialists to make sure you choose the right seismic levelling feet for your project! At our website we have a configurator where you can fill in the requirements for your project. Afterwards the form will be sent to our seismic levelling feet specialist.

Find our configurator by scanning the below QR code and fill out the necessary information.

Based on your input, our seismic specialist will contact you regarding a non-binding solution for your seismic project.

Find Seismic configurator here